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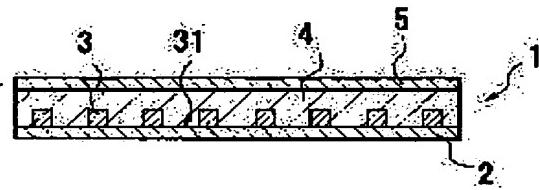
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(54) METHOD OF MANUFACTURING TRANSLUCENT ELECTROMAGNETIC WAVE SHIELD

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a method of manufacturing a protective layer which more raises the translucency of a translucent electromagnetic shield with a conductive layer, having a mesh-like wiring structure.

SOLUTION: The manufacturing method comprises steps of applying a translucent resin to form a protective layer 4 on a conductive layer 3 of a conductive material wired, such as meshes on a base layer 2, laminating a sheet layer 5 thereon, and hardening the resin. Laminating the sheet presses the outer surface of pre-hardened protective layer, which can smoothly level irregularities due to influence of the mesh-like conductive layer. This pressing of the pre-hardened protective layer resin makes the resin pushed in among the mesh-like wirings into a filled state such that spaces between the wirings are filled up fully, without openings.



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CLAIMS**[Claim(s)]**

[Claim 1] The manufacture approach characterized by including the process in which perform lamination processing by the web material from on the, and said translucency resin is stiffened after applying the translucency resin used as a protective layer on said conductive layer in the manufacture approach of the translucency electromagnetic wave shielding object which comes to form the conductive layer which wired electric conduction material in the shape of a mesh on a base material layer.

[Claim 2] The manufacture approach according to claim 1 which uses a translucency resin film or a translucency glass plate as a web material.

[Claim 3] The manufacture approach according to claim 1 or 2 which uses the resin of an ultraviolet curing mold or an electron ray hardening mold for the translucency resin made into a protective layer, and is stiffened by UV irradiation or electron beam irradiation after the lamination processing by the web material.

[Claim 4] The manufacture approach given in any 1 term of claims 1-3 which apply the translucency resin made into a protective layer with screen printing.

[Claim 5] The manufacture approach characterized by preparing a heat glue line in the manufacture approach of the translucency electromagnetic wave shielding object which comes to form the conductive layer which wired electric conduction material in the shape of a mesh on a base material layer between said conductive layers and protective layers formed on this conductive layer, and carrying out thermocompression bonding of said protective layer.

[Claim 6] The manufacture approach according to claim 5 over which heat adhesion resin is applied to the rear face of the translucency resin film made into a protective layer, this heat adhesion resin is contacted to a conductive layer, and a heat press is covered from on said translucency resin film.

[Claim 7] The translucency electromagnetic wave shielding object which is acquired by the manufacture approach given in any 1 term of claims 1-6, and has 3 layer structures of a wrap protective layer and ** for a base material layer, the conductive layer which comes to wire in the shape of a mesh in electric conduction material on this base material layer, and this conductive layer at least.

[Claim 8] The translucency electromagnetic wave shielding object according to claim 7 in which the glue line was formed at the rear face of a base material layer.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]**[0001]**

[Field of the Invention] This invention relates to the electromagnetic wave shielding object of suitable translucency to install in front faces of a display, such as a plasma display panel (PDP), especially about the electromagnetic wave shielding object which has a shielding function to an electromagnetic wave.

[0002]

[Description of the Prior Art] Although it has now been common sense to prevent the effect of the electromagnetic wave of electronic equipment, since plasma discharge is used, especially by PDP from which marketing recently began, the function which prevents electromagnetic wave leakage more than former is called for. It is necessary to prevent the electromagnetic wave from a screen, therefore the electromagnetic wave shielding object of translucency is suggested in display units, such as PDP.

[0003] As a translucency electromagnetic wave shielding object, what formed silver and the metal thin film of oxidization in JUUMU by sputtering is known. Although this raises translucency by forming a metal layer thinly, it is difficult for it for it to be satisfied with 1MHz - 1GHz required of an electromagnetic wave shielding effect by resistance becoming large by making a metal layer thin of the engine performance of 30db(s).

[0004] Then, the electromagnetic wave shielding object with the structure which formed the conductive layer by wiring electric conduction material, such as copper foil and a nickel foil, in the shape of a mesh (the shape of a grid) on a transparency base material layer (one side or both sides) is suggested to JP,9-283977,A like invention of an indication.

[0005]

[Problem(s) to be Solved by the Invention] Although the electromagnetic wave shielding object of this mesh-like wiring structure excels the thing of the above-mentioned diaphragm structure in translucency, in order to use it for a scope which is used as a TV apparatus to which it views and listens every day, PDP etc. cannot be said to be still sufficient transparency, but is asked for the further translucency.

[0006] That is, in the case of mesh-like wiring structure, form the protective layer of translucency resin on a conductive layer, he is trying to prevent oxidation etc., and usually forms this protective layer by screen printing, the curtain coating-machine method, the roll coater method, and the flow coater method. However, by this process, since a lower layer conductive layer is a mesh-like, unevenness of that mesh will be reflected in a front face, Yuzu skin-like irregularity will be made, and transparency will fall under the effect of the scattered reflection by this. Moreover, if the resin of a protective layer is not just choked up between wiring of mesh-like wiring (space part between wiring), it will become the factor in which scattered reflection comes also by the part and reduces transparency in it.

[0007] Then, this invention offers the manufacture approach which has translucency raised more about the translucency electromagnetic wave shielding object of mesh-like wiring structure.

[0008]

[Means for Solving the Problem] According to this invention, in the manufacture approach of the translucency electromagnetic wave shielding object which comes to form the conductive layer which wired electric conduction material in the shape of a mesh on a base material layer, after applying the translucency resin used as a protective layer on a conductive layer, it is characterized by including the process in which perform lamination processing by the web material from on the, and translucency resin is stiffened. According to this approach, by laminating the web material which made the front face smooth as much as possible, press can be applied to the outside surface of the translucency resin before hardening (protective layer), and the irregularity under the effect of a mesh-like conductive layer can be accustomed flat and

smooth. Moreover, it will be in the condition that translucency resin is pushed in and filled up with pressing the translucency resin before hardening between mesh-like wiring, and the space during wiring will fully be filled without a clearance.

[0009] A web material may exfoliate after hardening of translucency resin, and it leaves it as it is, and it is good in stripes as a part of protective layer. In this case, a web material is formed from a translucency resin film or a translucency glass plate. The translucency resin made into a protective layer is good to consider as the technique which uses the resin of an ultraviolet curing mold or an electron ray hardening mold, and is stiffened by UV irradiation or electron beam irradiation after lamination processing of a web material. In this case, ultraviolet rays or an electron ray may be irradiated from the base material layer side of transparency, and as long as a web material is translucency, it may be irradiated from a web-material side. Although screen printing, the curtain coating-machine method, the roll coater method, the flow coater method, etc. can be used for the method of application of translucency resin, in order to carry out partition spreading so that it may leave the touch-down part prepared in a conductive layer maximum outline, its screen printing is the optimal. A web material can be beforehand fabricated as the configuration of a partition.

[0010] According to this invention, in the manufacture approach of the translucency electromagnetic wave shielding object which comes to form the conductive layer which wired electric conduction material in the shape of a mesh on the base material layer, it is characterized by preparing a heat glue line between a conductive layer and the protective layer formed on this conductive layer, and carrying out thermocompression bonding of the protective layer besides above. That is, by carrying out thermocompression bonding, a heat glue line is made to enter enough between mesh-like wiring of a conductive layer, it is filled up, this absorbs the irregularity of a conductive layer, and a protective layer is maintained flat and smooth.

[0011] Although the approach of forming the translucency resin used as a protective layer on it is also possible since heat adhesion resin is previously applied on the conductive layer in order to prepare a heat glue line, it is good to consider as the process which forms a protective layer on a conductive layer by applying heat adhesion resin to the rear face of the translucency resin film made into a protective layer preferably, contacting this heat adhesion resin to a conductive layer, and covering a heat press from a top. Spreading of the heat adhesion resin on the rear face of a translucency resin film can use screen printing, the roll coater method, etc.

[0012] Since it has 3 layer structures of a wrap protective layer and ** for a base material layer, the conductive layer which comes to wire in the shape of a mesh in electric conduction material on this base material layer, and this conductive layer at least, and it fills up with a protective layer without a clearance between mesh-like wiring of a conductive layer and the translucency electromagnetic wave shielding object acquired by the process of above this inventions has a smooth front face, it serves as a product which was very excellent in transparency. When the glue line is prepared in the rear face of this product, i.e., the rear face of a base material layer, the attachment activity to a display etc. becomes easy and is desirable.

[0013]

[Embodiment of the Invention] The appearance of the translucency electromagnetic wave shielding object applied to this invention at drawing 1 is shown. The translucency electromagnetic wave shielding object 1 of illustration has 3 layer structures of the wrap protective layer 4 for the base material layer 2 of translucency, the conductive layer 3 considered as mesh-like wiring on it, and this conductive layer 3. The example of representation of the cross-section structure is shown in drawing 2 (a).

[0014] By this example, the base material layer 2 consists of highly transparent polyester resin, and let it be sheet metal with a thickness of about 0.1mm. The conductive layer 3 of mesh-like wiring is formed on the front face of this base material layer 2. Although the conductive layer 3 is formed in one side of the base material layer 2 in this example, it is also possible to form in both sides of the base material layer 2.

[0015] A conductive layer 3 uses metal membranes, such as metal Tomari, such as copper and nickel, silver, and oxidization in JUJMU, or conductive ink and the conductive paint which mixed such conductive material in ink or a coating, wires a mesh-like pattern by screen printing or the roll coater method, and obtains these electric conduction material. Thus, upwards the conductive layer 3 of mesh-like wiring was formed, a protective layer 4 is formed, and main front faces are covered.

[0016] The protective layer 4 could be formed from translucency resin, such as polyester resin, acrylic resin, and vinylchloride resin, and uses the highly transparent polyester resin same with the base material layer 2 in this example. While filling 31 between mesh-like wiring without a clearance by forming this with lamination mode of processing as shown below, the smooth front face 41 has been obtained.

[0017] The protective layer production process of the translucency electromagnetic wave shielding object 1 shown in this drawing 2 (a) applies polyester resin with screen printing from on a conductive layer 3, after forming from the base material layer 2 to the conductive layer 3 by technique as usual first. It is possible to divide correctly unnecessary parts of a protective layer 4, such as an earth terminal to expose, and to apply them by using this screen printing. After applying the polyester resin of a protective layer 4, before stiffening the resin, lamination processing which sticks a web material 5 from a top as shown in drawing 3 is carried out.

[0018] In lamination processing, while the applied polyester resin is soft, from on the, the web material 5 with a smooth front face is covered and put, and is stuck. A web material 5 is the resin film or glass plate set by the flat-surface configuration of the field which forms a protective layer 4, while the polyester resin of the soft protective layer 4 is pushed in by the press when sticking this and it is filled up that there is no clearance in 31 between wiring, the front face of a protective layer 4 is accustomed by the web material 5, and flattening of it is carried out.

[0019] Since it does not have a flattening process like this example, in unevenness being possible for protective layer 104 front face according to the irregularity which originates in the shape of [of a conductive layer 103] a mesh according to the translucency electromagnetic wave shielding object 100 of the conventional technique shown in drawing 2 (b), the clearance had opened without the inside of a protective layer 104 also fully burying 131 between wiring of a conductive layer 103, and these became the basis of scattered reflection and had influenced transparency. the result it is markedly alike and improves by these troubles being solved by this invention has been obtained. [of transparency]

[0020] After lamination processing irradiates ultraviolet rays, stiffens a protective layer 4, and makes it complete from a base material layer 2 or web-material 5 side in this example. After hardening, although he is trying to remove a web material 5 in the example of drawing 2 , it is also possible to a protective layer 4 and really leave as a layer in the state of drawing 3 . In this case, it considers as the translucency resin film which also formed the web material 5 from highly transparent resin.

[0021] In drawing 4 - drawing 7 , other examples of the translucency electromagnetic wave shielding object which can be created at the same process as the above are ******(ed).

[0022] The example of drawing 4 is an example which arranged the adhesive layer 6 and the release paper 7 in the rear face of the base material layer 2 used as the opposite side of the field in which the conductive layer 3 and the protective layer 4 were formed, as a glue line. According to this example, it can stick on the object of a display etc. easily by removing a release paper 7 and exposing an adhesive layer 6.

[0023] The example of drawing 5 is an example which formed the touch-down wiring 8 in the periphery section of the base material layer 2. The touch-down wiring 8 surrounding such a perimeter can be formed in coincidence as a conductive layer 3 and this quality of the material. It divides and the protective layer 4 in this case is applied so that the touch-down wiring 8 may be exposed.

[0024] Although it is the example which formed the touch-down wiring 8 as well as drawing 5 , a web material 5 is unified as a part of protective layer 4, and it has left the example of drawing 6 . The configuration of the field which forms a protective layer 4 is made to adjust the web material 5 in this case, and it is formed beforehand. The example in which drawing 6 (a) formed the touch-down wiring 8 in the periphery like drawing 5 , and drawing 6 (b) are the examples for which the touch-down wiring 8 was rotated to the rear face of the base material layer 2.

[0025] The example of drawing 7 is an application of the example of drawing 4 , and is an example which formed the thermocompression bonding layer 9 in the rear face of the base material layer 2 as a glue line. That is, it is made to carry out thermocompression bonding to an object with a heat press etc. rather than removes and sticks a release paper 7 like drawing 4 .

[0026] The example of drawing 8 is an example which changed the process. In this example, the polyester resin film of a configuration set by the flat-surface configuration of the conductive layer 3 to cover is made into protective layer 4', and the thing in which the heat glue line 10 was formed at the rear face (medial surface) is prepared. The heat glue line 10 is applied to the film rear face of protective layer 4' with screen printing.

[0027] Thermocompression bonding of protective layer 4' with this heat glue line 10 is carried out with a heat press from lamination and on its on the base material layer 2 in which the conductive layer 3 was formed. Since the heat glue line 10 which became soft at the time of this thermocompression bonding process enters that there is no clearance in 31 between mesh-like wiring of a conductive layer 3, the highly transparent translucency electromagnetic wave shielding object 1 can be acquired like the example of drawing 2 .

[0028]

[Effect of the Invention] According to the translucency electromagnetic wave shielding object concerning this invention, a protective layer with the smooth front face which the Yuzu skin condition resulting from mesh-like wiring of a conductive layer was canceled, and filled between mesh-like wiring without the clearance is offered. thereby, compared with the conventional product, it can be markedly alike, and a highly transparent translucency electromagnetic wave shielding object can be offered now. Therefore, various kinds of application -- the application also colors monitor displays, such as breadth, a television screen, and a personal computer, the display screen of a portable telephone, or a base material layer sharply, and uses it for the case of a skeleton product -- is possible.

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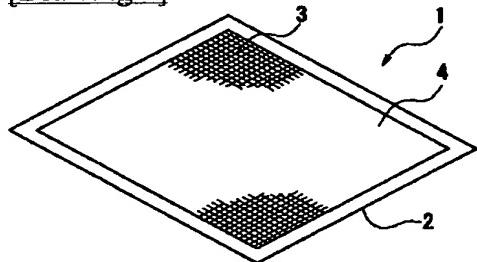
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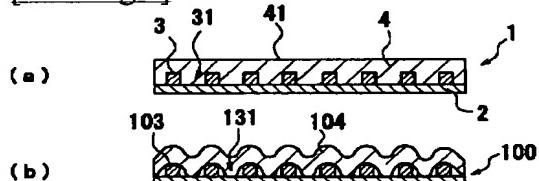
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DRAWINGS

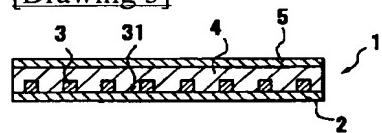
[Drawing 1]



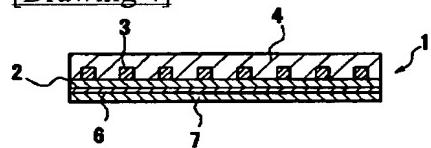
[Drawing 2]



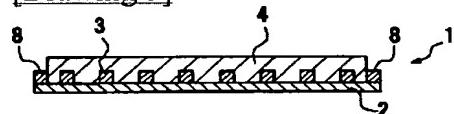
[Drawing 3]



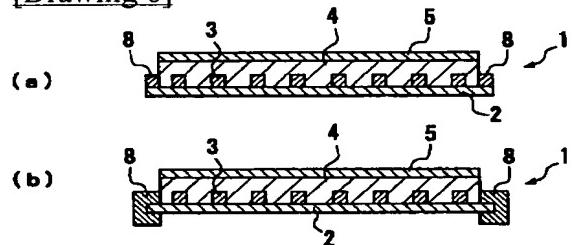
[Drawing 4]

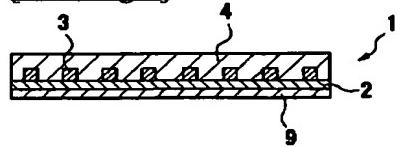
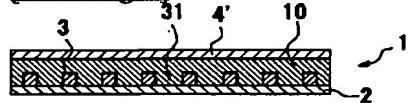


[Drawing 5]



[Drawing 6]



[Drawing 7][Drawing 8]

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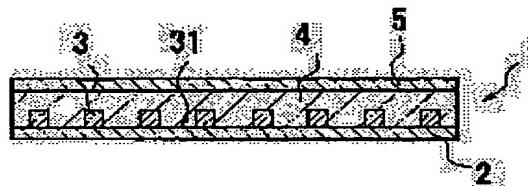
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SOLUTION: The manufacturing method comprises steps of applying a translucent resin to form a protective layer 4 on a conductive layer 3 of a conductive material wired, such as meshes on a base layer 2, laminating a sheet layer 5 thereon, and hardening the resin. Laminating the sheet presses the outer surface of pre-hardened protective layer, which can smoothly level irregularities due to influence of the mesh-like conductive layer. This pressing of the pre-hardened protective layer resin makes the resin pushed in among the mesh-like wirings into a filled state such that spaces between the wirings are filled up fully, without openings.



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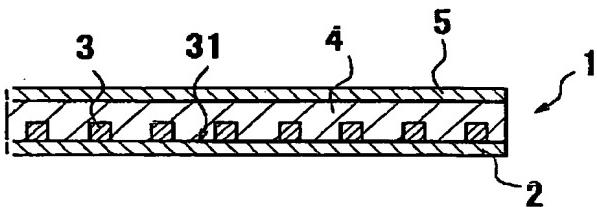
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(54)【発明の名称】透光性電磁波シールド体の製造方法

(57)【要約】

【課題】網目状配線構造の導電層をもつ透光性電磁波シールド体について、より透光性を高められるような保護層の製造方法を提供する。

【解決手段】基材層2の上に導電材を網目状に配線した導電層3の上に、保護層4となる透光性樹脂を塗布した後に、その上からシート材5によるラミネート処理を施して透光性樹脂を硬化させる過程を含む。シート材をラミネートすることにより、硬化前の保護層樹脂の外表面に押圧を加え、網目状導電層の影響による凹凸を平滑にならしてしまうことができる。また、硬化前の保護層樹脂を押圧することで、網目状の配線間に樹脂が押し込まれて充填される状態となり、配線間の空間が隙間なく十分に埋め尽くされる。



透光性樹脂は、紫外線硬化型又は電子線硬化型の樹脂を利用し、シート材のラミネート処理後に紫外線照射又は電子線照射により硬化させる手法とするとい。この場合、紫外線又は電子線は、透明の基材層側から照射してもよいし、シート材が透光性であればシート材側から照射してもよい。透光性樹脂の塗布方法は、スクリーン印刷法、カーテンコーティング法、ロールコーティング法、フローコーティング法などを利用できるが、導電層最外郭に設けられる接地部分を残すように区画塗布するには、スクリーン印刷法が最適である。シート材は予め区画の形状どおりに成形しておくことができる。

【0010】以上のお他にも本発明によれば、基材層の上に導電材を網目状に配線した導電層を形成してなる透光性電磁波シールド体の製造方法において、導電層と該導電層上に形成される保護層との間に熱接着層を設けて保護層を熱圧着することを特徴とする。すなわち、熱圧着することにより、熱接着層を導電層の網目状配線間に十分入り込ませて充填し、これにより導電層の凹凸を吸収して保護層を平滑に維持するものである。

【0011】熱接着層を設けるには、熱接着樹脂を先に導電層上に塗布しておいてから、その上に保護層となる透光性樹脂を形成する方法も可能であるが、好ましくは、保護層とする透光性樹脂フィルムの裏面に熱接着樹脂を塗布し、この熱接着樹脂を導電層に接触させて上から熱プレスをかけることにより導電層上に保護層を形成する過程とするのがよい。透光性樹脂フィルム裏面への熱接着樹脂の塗布は、スクリーン印刷法、ロールコーティング法などを利用することができる。

【0012】以上のような本発明の製法により得られた透光性電磁波シールド体は、基材層と、この基材層上に導電材を網目状に配線してなる導電層と、この導電層を覆う保護層と、の三層構造を少なくとも有し、導電層の網目状配線間に保護層が隙間なく充填され、且つ平滑表面を有するので、非常に透明度の優れた製品となる。本製品の裏面、つまり基材層の裏面には、接着層を設けておくと、ディスプレイなどへの貼り付け作業が簡単になり好ましい。

【0013】

【発明の実施の形態】図1に、本発明に係る透光性電磁波シールド体の外観を示している。図示の透光性電磁波シールド体1は、透光性の基材層2、その上の網目状配線とした導電層3、該導電層3を覆う保護層4の三層構造をもっている。図2(a)に、その断面構造の代表例を示す。

【0014】基材層2は、本例では透明度の高いポリエチレン樹脂からなり、0.1mmほどの厚さの薄板とされている。この基材層2の表面上に、網目状配線の導電層3が形成されている。本例では基材層2の片面に導電層3を形成してあるが、基材層2の両面に形成することも可能である。

【0015】導電層3は、銅やニッケルなどの金属泊、銀や酸化インジウムなどの金属膜、あるいは、このような導電物質をインクや塗料に混入した導電性インクや導電性塗料を利用し、これら導電材を、スクリーン印刷法やロールコーティング法により網目状パターンに配線して得る。このようにして網目状配線の導電層3を形成した上に、保護層4を形成して主要表面を覆い隠す。

【0016】保護層4は、ポリエチレン樹脂、アクリル樹脂、塩化ビニール樹脂などの透光性樹脂から形成可能で、本例では、基材層2と同じく透明度の高いポリエチレン樹脂を利用している。これを、以下に示すようなラミネート処理方式で形成することにより、網目状配線間3-1を隙間なく埋め尽くすとともに、平滑な表面4-1を得られている。

【0017】この図2(a)に示す透光性電磁波シールド体1の保護層製造工程は、まず、従来どおりの手法により基材層2から導電層3までを形成した後、導電層3の上から、スクリーン印刷法によりポリエチレン樹脂を塗布する。このスクリーン印刷法を使用することで、露出させておく接地端子など保護層4の必要ない部分を正確に区画して塗布することが可能である。保護層4のポリエチレン樹脂を塗布した後は、その樹脂を硬化させる前に、図3に示すごとくシート材5を上から貼り合わせるラミネート処理を実施する。

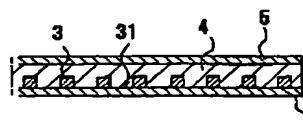
【0018】ラミネート処理では、塗布したポリエチレン樹脂が柔らかいうちに、その上から表面の平滑なシート材5を覆い被せて貼り合わせる。シート材5は、保護層4を形成する領域の平面形状に合わせた樹脂フィルム又はガラス板で、これを貼り合わせるときの押圧により、柔らかい保護層4のポリエチレン樹脂が押し込まれて配線間3-1に隙間なく充填されるとともに、シート材5により保護層4の表面がならされ、平坦化される。

【0019】図2(b)に示してある従来技術の透光性電磁波シールド体100によると、本例のごとき平坦化工程をもたないため、導電層103の網目状に起因する凹凸に従って保護層104表面に凸凹ができてしまううえ、保護層104の内側も導電層103の配線間131を十分に埋めておらずに隙間があいており、これらが乱反射のもとなつて透明度に影響していた。これらの問題点が本発明により解決されることで、透明度が格段に向上する結果を得られている。

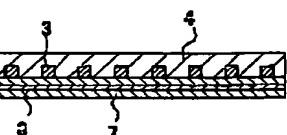
【0020】ラミネート処理後は、基材層2の側又はシート材5の側から、本例の場合は紫外線を照射して保護層4を硬化させて完成させる。硬化後、図2の例ではシート材5を剥がしてしまうようにしているが、図3の状態で保護層4と一体層として残しておくことも可能である。この場合、シート材5も透明度の高い樹脂から形成した透光性樹脂フィルムとしておく。

【0021】図4～図7には、上記同様の工程にて作成可能な透光性電磁波シールド体の他の例を各種示してい

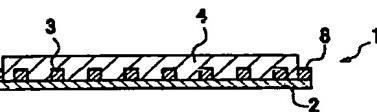
【図3】



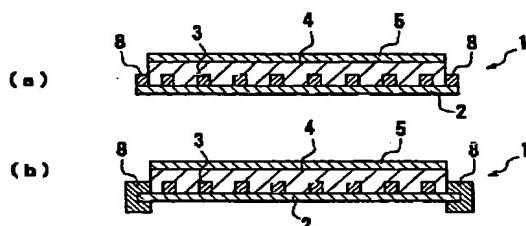
【図4】



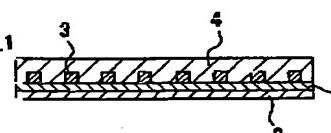
【図5】



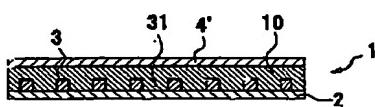
【図6】



【図7】



【図8】



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